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The Information Content of Inflation Swap Rates for the Long-Term Inflation Expectations of Professionals: Evidence from a MIDAS Analysis

Ahmed Hanoma
Dieter Nautz

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Ahmed Hanoma and Dieter Nautz*

Freie Universität Berlin

Department of Economics

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Long-term inflation expectations taken from the Survey of Professional Forecasters are a major source of information for monetary policy. Unfortunately, they are published only on a quarterly basis. This paper investigates the daily information content of inflation-linked swap rates for the next survey outcome. Using a mixed data sampling approach, we find that professionals account for the daily dynamics of inflation swap rates when they submit their long-term inflation expectations. We propose a daily indicator of professionals' inflation expectations that outperforms alternative indicators that ignore the high-frequency dynamics of inflation swap rates. To illustrate the usefulness of the new indicator, we provide new evidence on the (re-)anchoring of U.S. inflation expectations.

Keywords: Inflation Expectations Dynamics, Expectations Anchoring, MIDAS.

JEL classification: E31, E52, C22.

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Corresponding author at: Freie Universität Berlin, Department of Economics, Boltzmannstrasse 20, 14195 Berlin, Germany. Tel.: +49(0) 30838 51399. E-mail: a.hanoma@fu-berlin.de; dieter.nautz@fu-berlin.de.

1 Introduction

The quarterly Survey of Professional Forecasters (SPF), where a panel of academic and financial market experts report their long-term inflation expectations, has been increasingly used by central banks for explaining and evaluating the monetary policy stance. The empirical literature confirms the importance of surveys from various perspectives. Recent contributions show that survey-based inflation expectations can be used to improve estimates of trend inflation (Chan et al., 2018), the term structure of inflation expectations (Kozicki and Tinsley, 2012), the credibility of a central bank's inflation target (Mehrotra and Yetman, 2018a,b), and to assess the anchoring of inflation expectations (Nautz et al., 2018).

While surveys of long-term inflation expectations receive a lot of attention in academia and in monetary policy practice, they suffer from the crucial disadvantage that they are released only infrequently.[1] However, a central bank monitoring vigilantly the evolution of inflation expectations can hardly wait until the next survey is published. Rather, policy makers ought to know as soon as possible whether and how a certain news or policy announcement will affect the long-term inflation expectations of professionals. The aim of the current paper is, therefore, the estimation of an early indicator of the quarterly SPF that can be used to monitor the long-term inflation expectations of professionals on a daily basis.

A straightforward solution to the problem of low frequency surveys seems to be market-based measures of inflation expectations. Recently, inflation-linked swap rates have become a widely-used daily indicator of inflation expectations because they are assumed to be less distorted by liquidity and risk premiums than more traditional measures like breakeven inflation rates, see Fleming and Sporn (2013). Yet, inflation swap rates are also highly volatile and often found to be less reliable than survey-based measures of inflation expectations, see e.g. Gil-Alana et al. (2012), Faust and Wright (2013) and Bauer and McCarthy (2015). Thus, the information content of inflation swap rates for the long-term inflation expectations of professionals is not obvious.

[1] Long-term inflation expectations of the Michigan Consumer Survey are provided on a monthly basis but tend to follow the outcomes of quarterly SPF surveys, see Carroll (2003). The Blue Chip forecasts employed by Chan et al. (2018) are only a bi-annual publication.

The empirical literature on the link between inflation swap rates and survey-based long-term inflation expectations is surprisingly scant. Due to data availability, empirical studies often restrict the analysis to *short–* and *medium-term* survey expectations with forecasting horizons up to two years, see e.g. Ghysels and Wright (2009), Kozicki and Tinsley (2012), Mehrotra and Yetman (2018a,b) or Grothe and Meyler (2015). Therefore, this paper investigates the empirical relationship between *long-term* inflation swap rates and the corresponding quarterly survey-based expectations of professionals with a forecast horizon of 5 years forward in 5 years.

If inflation swap rates are used by professionals to form their long-term inflation expectations or if, *vice versa*, professionals' expectations affect inflation swaps, then the latter should contain information about the expectations of professionals on a daily basis. Following Ghysels and Wright (2009), we employ MIxed DAta Sampling (MIDAS) models for estimating low frequency survey outcomes with high frequency inflation swap rates. Our empirical results confirm that the information content of daily inflation swap rates is not negligible and significantly improves the explanation of quarterly survey outcomes. We show that professional forecasters make use of the information contained in inflation swap rates in a sophisticated way that takes into account their high-frequency dynamics.

We use the estimated MIDAS model to generate a daily indicator of long-term inflation expectations. To that purpose, we predict for each day how professionals would respond if there was a survey on that day. The resulting daily expectations indicator is compared with more direct ways of exploiting the information contained in inflation swap rates. Since professionals' inflation expectations remain unobservable on non-survey days, it is not obvious how to evaluate the indicators proposed. Following e.g. Monteforte and Moretti (2013), we compare the daily indicators with the next survey outcome. Note that this performance criterion is not without problems in our application because it assumes that any change in expectations has already appeared immediately after the deadline of the previous survey. Whenever professionals actually adjusted their long-term inflation expectations at some later day within the quarter, this implies spuriously large forecasting errors and a clear underestimation of the indicator's information content. In spite of this problem, our results strongly suggest that the MIDAS-based indicator provides more information about professional forecasters' long-term inflation expectations than alternative indicators that ignore the dynamics of daily inflation swap rates.

To further illustrate the usefulness of the estimated daily expectations indicator for monetary policy analysis, we re-investigate the anchoring of U.S. inflation expectations. Since well-anchored long-term inflation expectations should not respond to macroeconomic news, a standard anchoring test in the literature involves the regression of expected inflation on surprises in macroeconomic data announcements, see e.g. Bauer (2015) or Nautz and Strohsal (2015). We find that the results obtained from news regressions partly depend on the underlying expectations measure. While both measures confirm a de-anchoring of expectations during the crisis period, the MIDAS-based indicator shows that the re-anchoring of U.S. inflation expectations took longer than suggested by inflation swap rates.

The rest of the paper is structured as follows. Section 2 describes the inflation expectations measures and Section 3 introduces the MIDAS model. Section 4 provides the estimation results and discusses the resulting daily indicator of long-term inflation expectations. Section 5 provides new evidence on the anchoring of U.S. inflation expectations. Section 6 offers some concluding remarks.

2 Measuring Long-Term Inflation Expectations

2.1 The Survey of Professional Forecasters

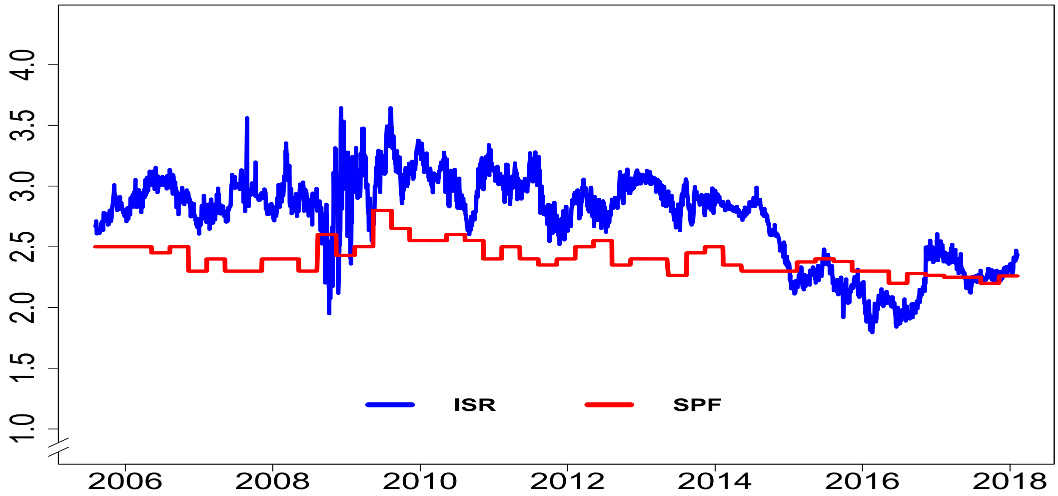
The Survey of Professional Forecasters is the oldest survey of macroeconomic forecasts in the United States.[2] The SPF panel consists of economists from the financial sector, academia, major consulting groups and research centers. Long-term inflation expectations taken from the quarterly Survey of Professional Forecasters are monitored regularly by central banks to assess the efficiency of their monetary policy and the credibility of their inflation target. In the following, our survey-based measure of long-term inflation expectations is the *5-year forward 5-year annual average CPI inflation rate* (CPIF5). This forward maturity is predominantly used by central banks and in the empirical literature because it eliminates the influence of short-term fluctuations. The Federal Reserve Bank of Philadelphia has been the source of this measure of long-term inflation expectations since 2005Q3. Thus, our sample period ranges from 2005Q3 until 2018Q1 and comprises 51 survey outcomes. Survey participants can only form their expectations based on information that is actually available when they submit their responses. Therefore, when combining quarterly surveys with daily market data, we take into account the exact timing of the survey.[3] Following the literature and monetary policy practice, we use the median of survey answers as the measure of professionals' long-term inflation expectations.

Figure 1 shows the development of long-term inflation expectations of professionals. Similar to alternative surveys, including the bi-annually Livingston Index, or the Michigan Survey of Consumers, long-term SPF expectations are highly persistent. Specifically, in 8 out of 51 quarters, the median response of the survey did not change at all. Apparently, the no-change forecast is a relevant benchmark for any forecasting model of survey-based long-term inflation expectations.

[2] The survey began in 1968 and was conducted by the American Statistical Association and the National Bureau of Economic Research. The Federal Reserve Bank of Philadelphia took over the survey in 1990.

[3] In the SPF, the hard deadline for responses is set in the interval from the second to the third week of the middle month of the relevant quarter. The release date of the survey is usually three to five days after the deadline, see https://www.philadelphiafed.org for the exact deadline and release dates.

Figure 1 U.S. Long-Term Inflation Expectations



Notes: 5 years in 5 years inflation expectations taken from the quarterly Survey of Professional Forecasters (SPF) and daily data for the corresponding inflation swap rate (ISR) from 2005Q4 to 2018Q1. Source: Federal Reserve Bank of Philadelphia (CPIF5) and Bloomberg (FWISUS55).

2.2 Market-Based Measures of Long-Term Inflation Expectations

In addition to the SPF, policymakers are interested in a range of different indicators of long-term inflation expectations. In recent years, as a result of the development of the market of inflation derivatives, inflation swap rates have become the new standard for market-based measures of inflation expectations, see Fleming and Sporn (2013). An inflation-linked swap is a contract by which a fixed inflation swap leg is exchanged against the realized inflation rate over an agreed horizon. The swap fixed leg can therefore be viewed as a measure of investors' inflation expectations over the contract period.

In order to match the expectations horizon of the SPF, we use the 5-year forward 5-year ahead inflation swap rate as the relevant market-based measure of long-term inflation expectations. Figure 1 confirms that the information content of inflation swap rates for survey-based expectations is not obvious. Standard unit root tests indicate that inflation swap rates are stationary, compare Table 7 in the appendix. In our sample period, inflation swap rates were, on average, more than 30 basis points above survey outcomes and, in particular, much more volatile.

In the next section, we try to shed more light on the empirical relationship between daily inflation swap rates and the next survey outcome.

3 The MIDAS Bridge between Inflation Expectation Measures

The natural framework for investigating the information content of *daily* inflation swap rates for *quarterly* surveys are mixed frequency data sampling (MIDAS) regressions. MIDAS solves the frequency mismatch problem between response and regressor(s). Instead of restricting the analysis to, e.g. quarterly averages, inflation swap rates are modeled at the daily frequency. As a result, the use of MIDAS regressions avoids information losses and mis-specification errors, see e.g. Andreou et al. (2011). The bulk of the literature using MIDAS models considers the relationship between quarterly and monthly or weekly series, see e.g. Clements and Galvão (2009). By contrast, the frequency gap between the quarterly survey observations and the daily inflation swap rates is much wider. In our application, there are 65 business days per quarter.

As a starting point of our analysis, consider the following distributed lag model

$$SPF_t = \mu + \alpha\, SPF_{t-1} + \sum_{j=1}^{65} \lambda_j\, ISR_{65t+1-j} + \varepsilon_t \tag{1}$$

where SPF_t ($t = 1, \ldots, 50$) denotes the quarterly SPF inflation expectation while ISR_τ ($\tau = 65t + 1 - j$) is the daily inflation swap rate. Note that the daily lag index j runs backward from the current survey deadline ($j = 1$ and $\tau = 65t$) to the day before the previous deadline ($j = 65$ and $\tau = 65(t-1) + 1$). This implies that the length of the daily lag window captures a full quarter. The inclusion of daily lags in an unrestricted model would rapidly eat up the model's degrees of freedom. In our application, the number of daily coefficients would even exceed the number of quarterly survey observations. To circumvent this problem, MIDAS models assume that the daily-lag coefficients λ_j follow a weighting function $w_{(j;\,\theta)}$ which depends on only a few hyper-parameters:

$$SPF_t = \mu + \alpha\, SPF_{t-1} + \lambda \sum_{j=1}^{65} w_{(j;\,\theta)}\, ISR_{65t+1-j} + \varepsilon_t \tag{2}$$

Following Ghysels et al. (2007), our empirical analysis uses the beta weighting function.[4] In its most general specification, the beta function depends on only three hyper-parameters $(\theta_1, \theta_2, \theta_3)$. For $j = 1, \ldots, 65$, the weights at the daily lag j are

$$w^U_{(j;\,\theta)} = \frac{x_j^{\theta_1-1}\,(1-x_j)^{\theta_2-1}}{\sum_{i=1}^{65} x_i^{\theta_1-1}\,(1-x_i)^{\theta_2-1}} + \theta_3; \quad \text{where } x_j = \begin{cases} \delta, & j=1 \\ (j-1)/64 & j=2,\ldots,64 \\ 1-\delta, & j=65 \end{cases} \tag{3}$$

and δ is a small number.[5] The beta weighting function is highly flexible. Depending on the values of θ_1, θ_2 and θ_3, beta weighting can generate dynamic effects ($\lambda_j = \lambda w_j$) of the high-frequency regressors that are flat, gradually decreasing, and even hump-shaped. We denote the MIDAS model based on this general, unrestricted version of the beta weighting function by M_U.

A hump-shaped pattern of weights and, thus, of daily lag-coefficients would imply that the median survey respondent puts more weight on inflation swap rates at some days before the survey's deadline. In our application, a monotonically decreasing weighting function would be more plausible because it ensures that professionals put the highest weight on the most recent information. Therefore, we compare our results obtained for the unrestricted beta weighting model (M_U) with a restricted model (M_R) where the weighting function is monotonous. A monotonous beta weighting is obtained by imposing that $\theta_3 = 0$ and $\theta_1 = 1$ implying the following weighting scheme:

$$w^R_{(j;\,\theta_2)} = \frac{(1-x_j)^{\theta_2-1}}{\sum_{i=1}^{65}(1-x_i)^{\theta_2-1}} \tag{4}$$

[4]Note that our main results do not depend on that choice. For brevity, these results are not presented but are available on request from the authors. For alternative weighting specifications, see e.g. Ghysels et al. (2007).

[5]In practice, approximately equal to $2.22 \cdot 10^{-16}$. Varying δ has no measurable impact on our results.

In the restricted MIDAS model, the hyper-parameter θ_2 determines the shape of the weights. The weights are decaying if $\theta_2 > 1$, increasing if $\theta_2 < 1$ and flat if $\theta_2 = 1$. Although the unrestricted MIDAS model M_U has only three hyper-parameters, its estimation involves optimization of a highly non-linear function. Therefore, the restricted model has become increasingly popular in empirical applications, see e.g. Ghysels and Ozkan (2015).

An important benchmark for MIDAS regressions is a model that accounts for the frequency mismatch simply by using quarterly averages of the daily data. Specifically, imposing $\theta_1 = 1, \theta_2 = 1$ and $\theta_3 = 0$, we consider a third variant of the beta weighting scheme that leads to the average model M_A, where each daily lag $j = 1, \ldots, 65$ is equally weighted:

$$w^A_{(j)} = \frac{1}{65} \tag{5}$$

The average model M_A can be interpreted as a degenerated (equally weighted) MIDAS model that ignores any high-frequency dynamics of the inflation swap rates. Hence, if the average model M_A can be rejected, the MIDAS models M_U or M_R contribute significantly to the estimation of survey outcomes.

4 Inflation Swap Rates and the Long-Term Inflation Expectations of Professionals: Empirical Results

4.1 MIDAS Analysis of Professionals' Long-Term Inflation Expectations

In this section, we employ the MIDAS framework to investigate the information content of daily inflation swap rates (ISR) for the quarterly Survey of Professional Forecasters (SPF). In a first step, we estimate the unrestricted MIDAS model (M_U) that allows for a hump-shaped weighting scheme of the daily inflation swap rates. The results presented in the first row of Table 1 confirm a significant and positive impact of the daily ISR on the quarterly SPF survey outcome. The relevant coefficient λ is statistically significant and plausibly signed. The partial sum of weights corresponding to the inflation swap rates of the previous week

(L1 + L2-5) is 87%. The memory decay structure of the impact of daily ISR on quarterly SPF validates ex-ante beliefs that recent lags, close to the deadline date, are more informative and therefore get more weight. This result is consistent with the findings of Ghysels and Wright (2009) about the formation of short term inflation expectations from SPF using interest rate differentials. It also confirms the results of the SPF special survey after 2009, in which the majority of the survey respondents report that they update their forecasts regularly, see Stark (2013).

Table 1 The Information Content of Daily Inflation Swap Rates for Long-Term Inflation Expectations of Professional Forecasters

$$SPF_t = \mu + \alpha\, SPF_{t-1} + \lambda \sum_{j=1}^{65} w_{(j;\,\theta)}\, ISR_{65t+1-j} + \varepsilon_t$$

Model	μ	α	λ	L1	L2-5	L6-65	Q(4)	R^2	LR
M_U	1.09	0.39	0.14	0.26	0.61	0.13	0.83	0.55	
	(0.21)	(0.11)	(0.06)						
M_R	1.08	0.38	0.15	0.25	0.53	0.22	0.65	0.53	0.37
	(0.20)	(0.10)	(0.05)						
M_A	1.05	0.42	0.12	$1/65$	$4/65$	$60/65$	0.34	0.47	0.02
	(0.23)	(0.11)	(0.04)						

Notes: SPF denotes the quarterly survey measure of professionals' long-term inflation expectations and ISR are daily inflation swap rates, see Equation (2). Table (1) shows the estimation results for three variants of the MIDAS model. M_U is the most general model where all hyper-parameters $\theta_1, \theta_2, \theta_3$ of the beta polynomial are unresticted. M_R is a restricted version assuming that $\theta_1 = 1$ and $\theta_3 = 0$. M_A assumes that all lags are weighted equally, i.e. $\theta_1 = \theta_2 = 1, \theta_3 = 0$. Sample period: 2005Q4 to 2018Q1. Standard errors in parentheses. L1, L2-5, and L6-65 show how much weight is placed on respective lag intervals starting from the survey deadline and counting backwards. $Q(4)$ is the p-value of the Ljung-Box statistic for serial correlation. LR displays p-values for testing the Models M_R vs M_U (0.37) and M_A vs M_R (0.02), respectively.

The second row of Table 1 shows the results for the model M_R where the hyper-parameters are restricted to ensure that the weighting scheme is monotonous. The restriction has no significant effect on the estimation results. The estimated impact of daily inflation swap rates, λ, increases only slightly from 0.14 to 0.15. Moreover, the differences between the partial sums (L1, L2-5, L6-65) of the restricted and the unrestricted weighting schemes are quite small such that the restricted weighting scheme is close to its unrestricted counterpart. As a consequence, the dynamic impact of inflation swap rates on survey outcomes is very similar in both MIDAS models. In particular, the LR test does not reject the restricted model (M_R) with a $p-$value 0.37. This confirms the intuition that professionals put more weight on more recent information.

The third model in Table 1 is the average model M_A. The estimated λ coefficient suggests that even the quarterly average of inflation swap rates has some information content for the long-term inflation expectations of professionals. However, the MIDAS analysis reveals that relevant information is lost if one completely ignores the high frequency dynamics of inflation swap rates. Specifically, the LR test rejects the degenerate model M_A against the MIDAS model M_R at the 5% level of significance.[6]

4.2 Daily Indicators of Professionals' Long-Term Inflation Expectations

The MIDAS regressions of the previous subsection provide new evidence on the expectation formation process of professional forecasters. In particular, we showed that professionals use information contained in the daily dynamics of inflation swap rates when they submit their expectations about long-term inflation at the survey's deadline, i.e. *at the end of the quarter*. In the current section, we investigate how these results can be used to assess the professionals' long-term inflation expectations also *within the quarter*. To that aim, we assume that the process of professionals' expectation formation and the dynamics of inflation swap rates are the same on survey and non-survey days.[7] In this case, MIDAS models should also be helpful for assessing the unobservable expectation of professionals within the quarter, i.e. on non-survey days.

Following Monteforte and Moretti (2013), we employ the estimated MIDAS model M_R in Table 1 to predict for each day how professionals would respond if there was a survey on that day. For each day $i = 0, \ldots, 64$ within a quarter $t = 1, \ldots, 50$, we construct a daily MIDAS-based indicator of professionals' long-term inflation expectations, $SPFI_{t,i}$, as fol-

[6]For robustness, we experimented with breakeven inflation rates as an alternative market-based measure of long-term inflation expectations. While our qualitative results remained unchanged, it is confirmed that inflation swap rates are more informative for the professionals' expectations than breakeven rates. In particular, the average model cannot be rejected when estimating a MIDAS model using breakeven inflation rates, see Table 8 in the appendix.

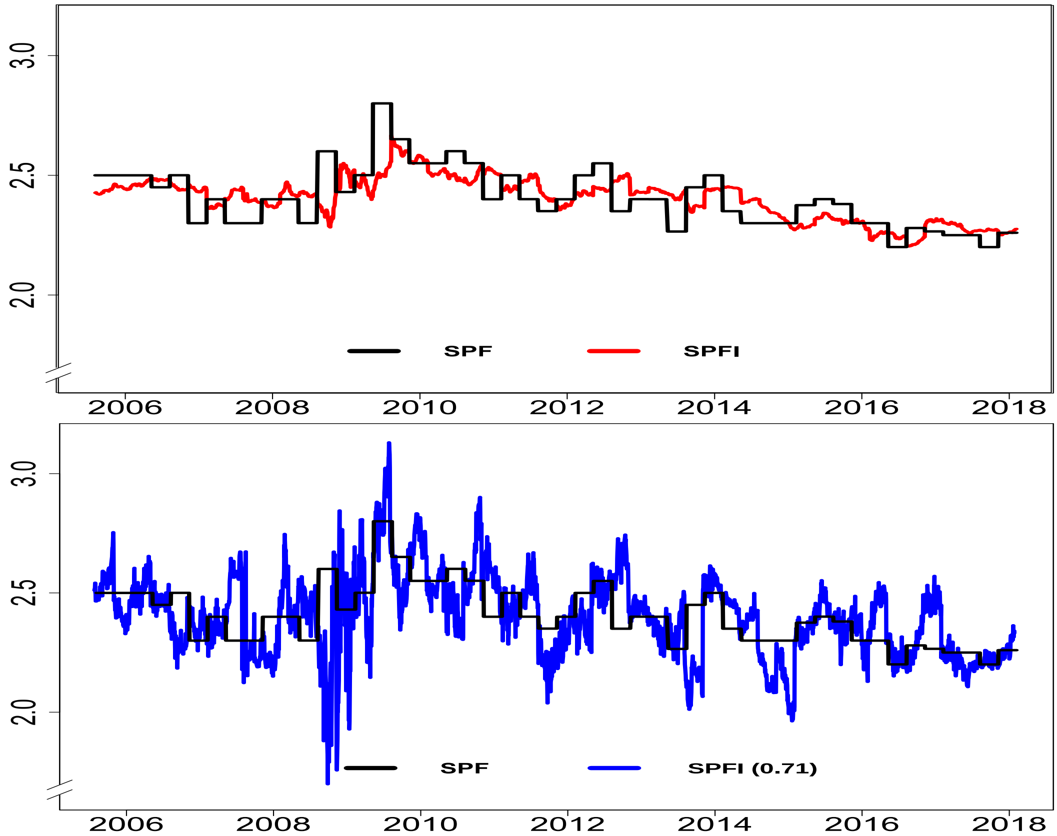
[7]Alternatively, we could estimate for each day within a quarter a MIDAS regression separately, compare Monteforte and Moretti (2013). While this procedure would improve the fit of the daily indicator, the resulting MIDAS models do not differ significantly in our application. For the sake of simplicity, we therefore refrain from estimating 65 models and base our analysis on a single model.

lows:

$$SPFI_{t,i} = 1.08 + 0.38\, SPF_{t-1} + 0.15 \sum_{j=1}^{65} \hat{w}^{R}_{(j;\,\hat{\theta}_2)}\, ISR_{65t+1-j-i} \tag{6}$$

Adopting the notation of the previous section, $SPFI_{t,i} = SPFI_{65t-i}$ defines the daily expectations indicator valid i days before the survey deadline in quarter t. Therefore, on a deadline day ($i = 0$), the daily indicator $SPFI_{65t}$ and the quarterly survey estimate implied by the MIDAS model M_R coincide by construction. Within the quarter, i.e. for $i > 0$, the indicator is also based on the MIDAS model but only uses inflation swap rates up to that day. The resulting daily indicator of professionals' long-term inflation expectations is shown in Figure 2.

Figure 2 U.S. Daily Indicators of Professionals' Long-Term Inflation Expectations



Notes: The upper panel shows the daily MIDAS indicator of professionals' long term expectations, $SPFI_{t,i} = 1.08 + 0.38\, SPF_{t-1} + 0.15 \sum_{j=1}^{65} \hat{w}^{R}_{(j;\,\hat{\theta}_2)}\, ISR_{65t+1-j-i}$. The lower panel displays an alternative indicator of SPF forecasts based on an partial adjustment process: $SPFI(0.71)_{t,i} = SPF_{t-1} + 0.71(ISR_{65t-i} - IRS_{65(t-1)})$, with $0.71 = \frac{\sigma_{\Delta SPF}}{\sigma_{\Delta ISR}}$.

Let us now compare the MIDAS-based measure of long-term inflation expectations with alternative daily indicators. We are particularly interested in indicators that ignore the MIDAS-specific high-frequency dynamics but account for the information content of inflation swap rates in a more direct way. A first candidate for a straightforward daily indicator of professionals' long-term inflation expectations might be the level of the current inflation swap rate, i.e. ISR_{65t-i}. Yet, Figure 1 has already demonstrated that daily inflation swap rates are only loosely connected to SPF outcomes. In fact, neither the level nor the volatility of inflation swap rates are close to those of actual survey outcomes. It is more realistic to assume that professionals adjust their long-term inflation expectations in response to the observed changes in inflation swap rates. Therefore, a more plausible daily indicator of professionals' long-term inflation expectations can be derived from the following forecasting scheme,

$$SPFI_{t,i}(\gamma) = SPF_{t-1} + \gamma(ISR_{65t-i} - IRS_{65(t-1)}) \quad (7)$$

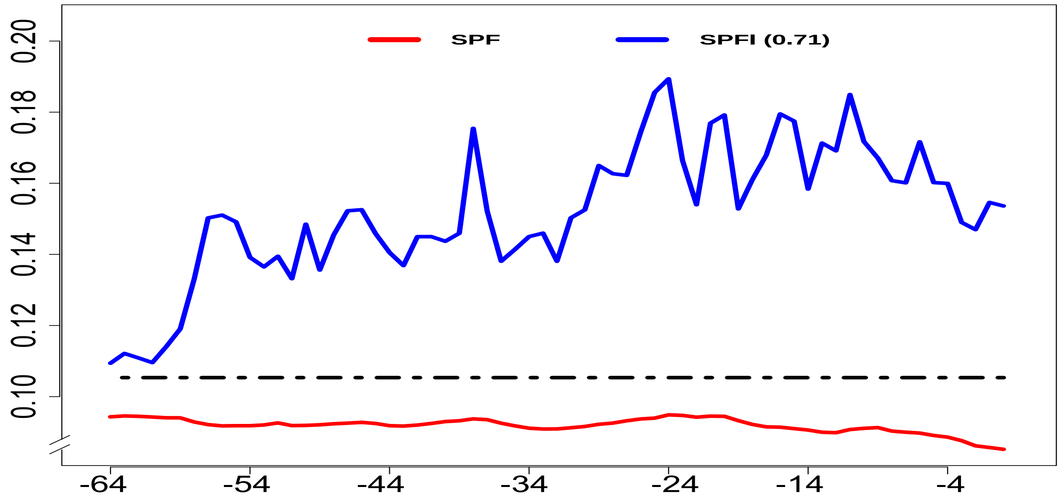
where SPF_{t-1} is the previous survey outcome, $(ISR_{65t-i} - IRS_{65(t-1)})$ is the difference between the current inflation swap rate and the rate valid at the previous survey deadline, and $0 \leq \gamma \leq 1$ is an adjustment coefficient. When inflation swap rates have remained unchanged since the previous survey deadline, $SPFI_{t,i}(\gamma)$ equals the previous survey outcome. For $\gamma > 0$, the resulting daily indicator implies that long-term inflation expectations of professionals (partially) adjusts upwards [downwards] if the current inflation swap rate has increased [decreased] since the previous survey. For $\gamma = 0$, the partial adjustment scheme yields the no-change forecast. The adjustment coefficient γ ensures that daily estimates of professionals' long-term inflation expectations are not too volatile. The larger γ, the higher the volatility of the daily indicator. In the limiting case of a full adjustment to daily inflation swap rates ($\gamma = 1$), the volatility of the resulting daily indicator ($SPFI(1)$) would be unrealistically high. Therefore, more realistic adjustment coefficients account for the excess volatility of inflation swap rates. All our main findings can be illustrated for the case $\gamma = 0.71$ where the size of γ accounts for the different volatilities of quarterly changes in inflation swap rates and survey expectations, i.e. $0.71 = \frac{\sigma_{\Delta SPF}}{\sigma_{\Delta ISR}}$. The resulting indicator $SPFI(0.71)$ is displayed in the lower panel of Figure 2. As expected, it is more volatile than the MIDAS-based indicator $SPFI$ displayed in the upper panel. Yet, compared with a naive use of the current inflation swap rates, the daily indicator $SPFI(0.71)$ is much closer to the actual survey outcomes, both in terms of level and volatility.

4.3 Assessing Daily indicators of Professionals' Long-term Inflation Expectations

How to assess the empirical performance of daily indicators when professionals' long-term inflation expectations cannot be observed at non-survey days? Here, we follow Monteforte and Moretti (2013) and compare the within-quarter predictions of the daily indicator with the end-of-quarter realization of the survey. Note that this standard criterion implicitly assumes that any change in long-term inflation expectations has appeared immediately after the previous survey release. Suppose, for example, that professionals changed their long-term inflation expectations towards the end of the quarter, say, only a few days before the next survey deadline. In this case, long-term expectations and, thus, a daily indicator should be constant for most of the quarter. As a result, comparing the indicator with the next survey outcome leads to spurious forecasting errors. This demonstrates that the root mean square errors (RSME) of the indicator tend to understate its information content for the current value of professionals' long-term inflation expectations. Since this effect should be particularly pronounced at the beginning of the quarter, the RMSEs of the daily indicators should improve towards the end of the quarter.

Figure 3 shows the evolution of the within-quarter forecasting performance of the MIDAS-based indicator $SPFI$ and the representative alternative indicator $SPFI(0.71)$ displayed in Figure 2. Our findings can be summarized as follows. First of all, the RMSEs of the MIDAS-based indicator are always smaller than those of the alternative indicator. Second, in sharp contrast to $SPFI(0.71)$, the MIDAS-based indicator outperforms the no-change forecast of the survey at each day within the quarter. Since the no-change forecast is constant within a quarter, the resulting RMSE is also constant. Note that the no-change forecast has a high predictive content for the next survey because the quarterly variation of survey-based measures of long-term inflation expectations is relatively low in our sample period. Third, the RMSE improves for the MIDAS-based indicator over the quarter

Figure 3 The Forecasting Performance of Daily Indicators



Notes: The figure shows RSMEs of the daily indicators $SPFI$ and $SPFI(0.71)$ for each of the 65 days within a quarter. The flat line corresponds to the constant RMSE of the no-change forecast. The days are displayed chronologically starting with the first day after the deadline of the *previous* survey ($i = 64$) while the last day refers to the deadline day of the current survey ($i = 0$). For further explanation, see Figure 2.

reflecting that the RMSE at a day within the quarter cannot be calculated with respect to the (unobserved) long-term inflation expectation on that day but only with respect to the observable survey outcome at the end of the quarter. Interestingly, this plausible evolution of RMSEs cannot be observed for the alternative indicator. Note the daily indicators $SPFI(\gamma)$ are typically close to the no-change forecast at the beginning of the quarter, simply because $(ISR_{65t-i} - IRS_{65(t-1)})$ tends to be small for i close to 64, i.e. at a day close to the previous survey.

Table 2 RMSE Ratios of Daily Indicators for Professionals' Long-Term Inflation Expectations

Model	$SPFI$	$SPFI(1)$	$SPFI(0.71)$	$SPFI(0.57)$
$Month1$	0.881	1.571	1.278	1.159
$Month2$	0.880	1.872	1.474	1.303
$Month3$	0.856	2.069	1.568	1.350
$Quarter$	0.872	1.863	1.453	1.279
$Deadline$	0.808	1.979	1.458	1.236

Notes: The table shows monthly and quarterly averages of RMSE ratios of daily indicators for professionals' long-term inflation expectations relative to the no-change forecast. $SPFI$ is the MIDAS-based indicator and $SPFI(\gamma)$ are daily indicators derived from the partial adjustment Equation (7).

Table 2 summarizes our findings in terms of RSME ratios relative to the no-change forecast. In addition to the representative indicator $SPFI(0.71)$, we also show the results obtained for the case of full adjustment $SPFI(1)$ and for $SPFI(0.57)$ where $\gamma = 0.57$ is implied by the variance ratio $\frac{\sigma_{SPF}}{\sigma_{ISR}}$. Table 2 shows that only the MIDAS-based indicator $SPFI$ can outperform the no-change forecast. At the deadline (the only day when the actual survey expectation can be observed), the MIDAS-based indicator beats the no-change forecast by about 20%. Similar numbers are obtained when the RMSEs are calculated on a monthly or quarterly basis. By contrast, the results obtained for the indicators that ignore the MIDAS-specific dynamics of inflation swap rates ($SPFI(\gamma)$) cast severe doubts on their usefulness for assessing the daily evolution of professionals' long-term inflation expectations. While their performance improve for smaller values of γ, the resulting indicator for the limiting case of $\gamma = 0$, simply equals the no-change forecast.

5 The Anchoring of Inflation Expectations

If professionals are convinced that the central bank is able to maintain its inflation target, their long-term inflation expectations should not be affected by unexpected short-term economic developments. Therefore, a significant response of inflation expectations to macroeconomic news may indicate a de-anchoring of inflation expectations. Since Gürkaynak et al. (2010) and Beechey et al. (2011), so-called news regressions, where changes in inflation expectations are regressed on surprises in macroeconomic news announcements (MNAs), have become a standard tool to test for inflation expectations anchoring.[8] News regressions are typically based on market-based measures of inflation expectations, because a precise estimation of the sensitivity of inflation expectations to particular MNA surprises requires high-frequency expectations data. In view of the limited reliability of inflation swap rates as a daily measure of professionals' long-term inflation expectations, the following empirical

[8] A second strand of literature assumes that de-anchoring of inflation expectations is revealed by spill-overs from short-term to long-term inflation expectations, see e.g. Ciccarelli et al. (2017), Łyziak and Paloviita (2017), and Natoli and Sigalotti (2018). According to Nautz et al. (2018), news regressions cannot account for the complex dynamics of inflation expectations. In particular, if the effect of news on expectations is very persistent, the de-anchoring problem might be more severe than the immediate response of expectations seems to suggest.

analysis provides new evidence on U.S. inflation expectations anchoring taking into account the daily expectations indicator $SPFI$ proposed in the previous section.

Recently, Bauer (2015) estimated news regressions for various measures of U.S. long-term inflation expectations. For the period from 2005 until 2013, he found that both, daily long-term inflation swap rates and quarterly SPF expectations data respond significantly to MNA surprises. Accordingly, it is concluded that U.S. inflation expectations were not fully anchored in that period.

In the following, we re-estimate the news regression for the updated sample 2005 until 2018 for: (i) daily inflation swap rates (ISR), (ii) the quarterly SPF data and (iii) $SPFI$, the daily MIDAS-based indicator of long-term inflation expectations. Since the daily SPF indicator is particularly interesting on the days when professionals' expectations cannot be observed directly, the news regressions are run for non-survey days. For the sake of comparability, we collected the same set of 13 MNA surprises as did Bauer (2015). In accordance with Beechey et al. (2011), the set of MNA surprises consists of surprises to real as well as nominal variables. In line with the literature, quarterly data for MNA surprises are obtained by simply adding up the surprises over the quarter. For more information about the data, see Table 6 in the appendix.

The updated news regressions confirm the earlier evidence for all three expectations measures, see Table 3. In accordance with Bauer (2015), the significant F-statistics clearly indicate that U.S. long-term inflation expectations respond to macro news and are, thus, not perfectly anchored from 2005 to 2018. Yet, this might not be the whole story. The estimation of news regressions with constant parameters assumes that there is also a constant degree of (de-)anchoring over the whole sample period. However, there is evidence that the degree of anchoring of U.S. inflation expectations was particularly weak during the financial crisis, see e.g. Galati et al. (2011).[9] Nautz and Strohsal (2015) introduced multiple endogenous break point tests to capture the time-varying degree of inflation expectations anchoring. They

[9]A weaker anchoring of inflation expectations during the crisis period is also found for the Euro area ((Autrup and Grothe, 2014), (Nautz et al., 2017), (Łyziak and Paloviita, 2017), and (Speck, 2017)) and emerging market economies (De Pooter et al., 2014).

Table 3 The Response of U.S. Inflation Expectations to Macroeconomic News

	SPF	ISR	SPFI
Capacity Utilization	0.943	1.142*	0.018
	(0.80)	(0.59)	(0.02)
Consumer Confidence	0.622	-0.038	0.018
	(0.86)	(0.49)	(0.02)
Consumer Prices	0.321	1.141	0.046
	(0.89)	(0.71)	(0.03)
Durable Goods Orders	1.819*	0.536	0.031
	(0.93)	(0.47)	(0.02)
Employment Cost	1.916*	-0.706*	-0.047**
	(1.13)	(0.38)	(0.02)
GDP Advanced	-5.218***	1.872**	0.018
	(1.60)	(0.78)	(0.04)
Initial Jobless Claims	0.379	-0.726*	-0.046**
	(0.39)	(0.38)	(0.02)
ISM Index	-1.977*	-0.254	0.023
	(1.08)	(0.52)	(0.02)
Non-Farm Payrolls	0.558	0.992***	-0.006
	(0.82)	(0.39)	(0.05)
New Home Sales	-2.874**	0.444	0.009
	(1.21)	(0.35)	(0.01)
Core Prices	1.770	0.091	0.207***
	(2.04)	(1.51)	(0.06)
Retail Sales	-1.880*	0.731	0.056**
	(1.05)	(0.72)	(0.02)
Unemployment	-0.413	-0.255	-0.014
	(0.60)	(0.43)	(0.02)
No of Observations	50	1430	1430
R-squared	0.486	0.020	0.041
P-value (F-statistic)	0.007	0.006	0.000

Notes: The table shows the response of various measures of U.S. long-term inflation expectations to MNA surprises. SPF denotes the quarterly survey expectation, ISR the daily inflation swap rate, and $SPFI$ the daily MIDAS-based indicator of professionals' long-term inflation expectations. The sample (08/05/05 : 02/02/18) consists of non-survey days with MNA surprises. Survey-days range from the deadline until the day after the survey release. White heteroskedasticity consistent standard errors are shown in parentheses. Significance at the 10 percent, 5 percent, and 1 percent levels are denoted by *, **, and ***, respectively. P-values are for the hypothesis that all parameters are jointly zero.

confirm a significant de-anchoring of U.S. breakeven inflation rates in the aftermath of the financial crisis. Moreover, due to the absence of a significant second break, they conclude that U.S. inflation expectations have not been re-anchored ever since. In the following, we apply the multiple endogenous break point testing procedure to the news regressions for inflation swap rates (ISR) and the MIDAS indicator of inflation expectations $SPFI$.

The results of the multiple endogenous break point analysis are summarized in Table 4.[10] For inflation swap rates, the testing procedure indicates two significant breaks and, thus, three different anchoring regimes. The second regime, ranging from late January 2008 until August 2011, can be related to the financial crisis period. Thus, according to inflation swap rates, the sample can be divided into a pre-crisis, a crisis, and a post-crisis period. For the daily SPF indicator, Table 4 implies three significant breaks and, thus, even four anchoring regimes. Note that the crisis period found for the SPF indicator begins later in October 2008, but also ends in August 2011. The main difference is the additional third break found for the daily SPF indicator in September 2013 that further divides the post-crisis sample in two sub-periods.

Table 4 Time-Varying Response of Inflation Expectations to News: Results from Multiple Endogenous Break Point Tests

	# Breaks	F-statistic	5% Crit. Value	Break dates
ISR	0 vs. 1 *	49.66	27.03	1/31/2008
	1 vs. 2 *	31.58	29.24	8/05/2011
	2 vs. 3	19.97	30.45	
SPFI	0 vs. 1 *	54.12	27.03	10/23/2008
	1 vs. 2 *	39.19	29.24	8/16/2011
	2 vs. 3 *	39.18	30.45	9/06/2013
	3 vs. 4	26.52	31.45	

Notes: Results of the endogenous break point test procedure of Bai and Perron (2003a) applied to the news regressions shown in Table 3. We trim 15% of the observations at the boundaries of each regime. Critical values are taken from Bai and Perron (2003b).

Table 5 shows the results from the news regressions performed over the sub-periods implied by the break point tests. For both expectations measures and in line with earlier evidence, the de-anchoring of expectations is particularly severe in the crisis period. According to the F-statistics, there is a highly significant response of U.S. long-term inflation expectations to MNA surprises during the crisis. For the pre-crisis period, we find that expectations

[10]Note that very low R^2-statistics are a common finding for news regressions with daily data, even in periods of de-anchored expectations, see e.g. Bauer (2015). Nautz et al. (2017) showed that low R^2-statistics do not impede the performance of endogenous break point tests. With only 50 quarters of SPF data available, endogenous break point tests can only be applied to news regressions for daily measures of inflation expectations.

are well-anchored with respect to inflation swap rates while the anchoring of survey expectations seems to be less pronounced (p-value 0.043). Note, however, that this difference is due to the longer pre-crisis period assumed for the SPF indicator. In fact, the response of the SFP indicator to MNA surprises vanishes if the pre-crisis period is assumed to be the same for both expectations measures.

Table 5 The Time-Varying Degree of Inflation Expectations Anchoring

	Pre-Crisis		**Crisis**		**Post-Crisis**		
	ISR	SPFI	ISR	SPFI	ISR	SPFI	SPFI
Capacity Utilization	0.095	0.011	2.778**	0.140***	-0.118	-0.100**	0.001
	(0.69)	(0.03)	(1.25)	(0.04)	(0.54)	(0.04)	(0.03)
Consumer Confidence	0.075	0.078*	-0.001	0.055	0.171	-0.018	-0.029
	(1.47)	(0.05)	(0.97)	(0.06)	(0.56)	(0.04)	(0.02)
Consumer Prices	-0.216	0.041**	3.350	0.131	0.594	-0.005	0.032
	(0.34)	(0.02)	(2.11)	(0.20)	(0.61)	(0.05)	(0.03)
Durable Goods Orders	1.230	0.071*	-0.743	0.006	0.530	0.061	-0.002
	(1.15)	(0.04)	(1.69)	(0.07)	(0.45)	(0.06)	(0.01)
Employment Cost	2.188	0.044	-1.332***	-0.088***	1.039	-0.111	0.042
	(1.54)	(0.10)	(0.26)	(0.01)	(0.88)	(0.10)	(0.03)
GDP Advanced	-0.810*	-0.143***	4.896***	0.066	-0.397	-0.026	-0.007
	(0.48)	(0.04)	(1.01)	(0.11)	(0.69)	(0.08)	(0.03)
Initial Jobless Claims	0.052	-0.010	-1.396*	-0.105**	-0.493	-0.029	-0.025
	(0.33)	(0.01)	(0.79)	(0.05)	(0.35)	(0.02)	(0.02)
ISM Index	0.091	0.033	-1.298	0.011	0.588	-0.038	0.035*
	(0.59)	(0.03)	(1.06)	(0.04)	(0.74)	(0.05)	(0.02)
Non-Farm Payrolls	0.724	0.052	1.755**	-0.089	0.451	0.103**	-0.002
	(0.77)	(0.05)	(0.78)	(0.12)	(0.43)	(0.05)	(0.02)
New Home Sales	-0.353	-0.025	2.410*	0.043	0.707*	0.165***	0.012
	(0.49)	(0.02)	(1.25)	(0.04)	(0.42)	(0.05)	(0.02)
Core Prices	2.156	0.071	-1.659	0.244***	-5.282	-1.058*	0.192
	(1.42)	(0.08)	(1.22)	(0.06)	(4.91)	(0.58)	(0.20)
Retail Sales	-0.362	-0.011	0.778	0.097***	1.718*	0.041	0.077***
	(0.83)	(0.05)	(1.28)	(0.04)	(0.90)	(0.04)	(0.03)
Unemployment	-0.059	-0.093**	-0.532	0.044	-0.167	-0.100***	0.042*
	(1.29)	(0.04)	(0.76)	(0.04)	(0.50)	(0.04)	(0.02)
Sample Period	08/05/05:	08/05/05:	01/31/08:	10/23/08:	08/05/11:	08/16/11:	09/06/13:
	01/30/08	10/16/08	08/04/11	08/12/11	02/02/18	09/05/13	02/02/18
No of Observations	282	353	395	325	753	240	512
R-squared	0.015	0.064	0.079	0.102	0.015	0.090	0.029
P-value (F-statistic)	0.991	0.043	0.003	0.001	0.621	0.059	0.307

Notes: Table 5 shows the responses of changes in daily inflation swap rates (ISR) and the daily MIDAS-based indicator SPFI of professionals' long-term inflation expectations to surprises in macroeconomic data releases. The sub-sample are identified by multiple endogenous break point tests, see Table 4. White heteroskedasticity consistent standard errors are shown in parentheses. Significance at the 10 percent, 5 percent, and 1 percent levels are denoted by *, **, and ***, respectively. P-values are for the hypothesis that all parameters are jointly zero.

The results obtained for the post-crisis period are particularly interesting. According to inflation swap rates, market-based U.S. inflation expectations are well-anchored from August

2011 until 2018, i.e. the end of the sample period. At first sight, this result seems to contradict the findings of Nautz and Strohsal (2015). However, their sample ends in mid-2014. In fact, it can be shown that the endogenous break point test does not have enough power to detect the second break point if we use their shorter sample period. The re-anchoring of U.S. inflation expectations in the aftermath of the financial crisis can be related to important changes in the FED's monetary policy. Following Doh and Oksol (2018), the anchoring of expectations improved in response to the announcement of an inflation target in January 2012 and the FED's large-scale asset purchases (LSAP). In particular, in contrast to earlier unconventional monetary policy measures, the FED emphasized in November 2010 that the ultimate aim of the LSAPs is to stabilize inflation and not just to facilitate the extension of credit.

For the daily SPF indicator, a different picture emerges. The results of the news regressions suggest that the de-anchoring of professionals' long-term inflation expectations stirred by the financial crisis lasted longer. According to the SPF indicator, survey expectations remained de-anchored until June 2013, although to a lesser degree than during the crisis. Reflecting the more persistent behavior of survey expectations, the daily SPF indicator suggests that inflation expectations of professionals were fully anchored only from June 2013 onwards.

6 Conclusion

Inflation expectations taken from the quarterly Survey of Professional Forecasters (SPF) have become a major source of information for monetary policy. Unlike market-based measures of inflation expectations, surveys are not distorted by inflation risk premiums, which can be large in magnitude and highly volatile. The major disadvantage of surveys is that they cannot be used for monitoring long-term inflation expectations on a daily basis. In particular, the low-frequency of survey expectations makes it difficult to disentangle the effects of macroeconomic news or policy announcements on long-term inflation expectations and, thus, on the credibility of the central bank's inflation target. In this paper, we investigate how to mitigate the low-frequency problem of the SPF.

Based on a MIDAS analysis, we exploited the information content of daily inflation swap rates for the quarterly survey outcome and proposed a daily indicator of the long-term inflation expectations of professionals. We show that the daily SPF indicator has a more profound predictive content for the next survey outcome than alternative indicators that ignore the MIDAS dynamics, but use the inflation swap rates in a more direct way. We further demonstrate the usefulness of the daily SPF indicator in an analysis of the time-varying degree of U.S. inflation expectations anchoring. News regressions based on the SPF indicator suggest that the crisis-induced de-anchoring of professionals' inflation expectations lasted longer time than implied by inflation swap rates.

With a view to our relatively short sample period, we restricted our MIDAS analysis of SPF long-term inflation expectations to inflation swap rates. Following, for example, Ghysels and Ozkan (2015), the model could be extended to account for more explanatory variables, including long-term interest rates, exchange rates or asset prices.

Appendix: Data and Robustness Analysis

Table 6 Surprises from Macroeconomic News Announcements (MNA): Reuters Poll Survey

Surprise	*Description*	*Measurement*	*Code*
Capacity Utilization	the extent to which installed capacity is being used in production of goods and services as a percent of total capacity.	M, Percent, SA	USSCAPUTQ
Consumer Confidence	sentiment among consumers based on indices of attitudes toward personal finances, general business conditions, and prices.	M, Index , SA	USSCNFCOQ
Consumer Prices	consumers' prices for a market basket of consumer goods and services less food and energy.	MoM, Percent, SA	USSCORPRE
Durable Goods	the new orders value based on legal agreement between two parties, producer and purchaser.	MoM, Percent, SA	USSNODURB
Employment Cost	the growth rate in employee compensation relative to real output.	Q, Percent, SA	USSLCCV.E
GDP Advanced	market value of all goods and services produced within the US after adjustement for inflation.	QoQ, Percent, SA	USSGDPA.D
Initial Jobless Claims	the number of people who have filed jobless claims for the first time in the appropriate labor office.	W, Volume, SA	USSNCLM
ISM Index	monitors employment, production, inventories, new orders and supplier deliveries.	M, Index , SA	USSCNFBUQ
Non-Farm Payrolls	the number of employees on business payrolls from establishment survey employment.	M, Volume, SA	USSEMPALO
New Home Sales	sales of new single-family houses.	M, Volume, SA	USSHOUSEE
Core Prices	changes in GDP deflator excluding food and energy.	Q, Percent, SA	USSGDPACE
Retail Sales	the resale of new and used goods, to general public, for personal/household consumption.	MoM, Percent, SA	USSRETTOB
Unemployment Rate	the number of unemployed persons as percent of the labor force.	M, Percent, SA	USSUN%TOQ

Table 7   Unit Root Test

	SPF	ISR	BEI
Constant Only			
DF-Stat	-3.17	-5.43	-3.46
P-Value	0.03	0.01	0.01
Constant & Trend			
DF-Stat	-3.94	-7.43	-4.10
P-Value	0.02	0.01	0.01

Notes: Results of ADF unit root tests for various measures of long-term inflation expectations. Sample period is 2005Q4 to 2018 Q1. SPF is the 5year in 5year inflation expectation taken form the Survey of Professional Forecasters. ISR (FWISUS55) and BEI (USGG5Y5Y) denotes daily data for the inflation swap rate and the breakeven inflation rate with the same maturity. Data source: Bloomberg. Irrespective of the test specification applied, the results indicate that all long-term expectations measures are stationary.

Table 8   The Information Content of Daily Breakeven Inflation Rates for Long-Term Inflation Expectations of Professional Forecasters

$$SPF_t = \mu + \alpha\, SPF_{t-1} + \lambda \sum_{j=1}^{65} w_{(j;\,\theta)}\, BEI_{65t+1-j} + \varepsilon_t$$

Model	μ	α	λ	L1	L2-5	L6-65	Q(4)	R^2	LR
M_U	1.09	0.43	0.11	0.40	0.59	0.01	0.66	0.49	
	(0.19)	(0.09)	(0.03)						
M_R	1.03	0.45	0.11	0.34	0.54	0.12	0.58	0.47	0.39
	(0.22)	(0.11)	(0.03)						
M_A	0.93	0.53	0.08	$1/65$	$4/65$	$60/65$	0.34	0.44	0.10
	(0.25)	(0.13)	(0.03)						

Notes: Table (8) shows the estimation results for three variants of the MIDAS model applied to the breakeven inflation rate. For more information, see Table 1.

References

Andreou, E., Ghysels, E., and Kourtellos, A. 2011. "Forecasting with Mixed-Frequency Data." *Oxford Handbook of Economic Forecasting*, 225–245.

Autrup, S. and Grothe, M. 2014. "Economic Surprises and Inflation Expectations: Has Anchoring of Expectations Survived the Crisis?" *ECB Working Paper*, No 1671.

Bai, J. and Perron, P. 2003a. "Computation and Analysis of Multiple Structural Change Models." *Journal of Applied Econometrics*, 18(1):1–22.

Bai, J. and Perron, P. 2003b. "Critical Values for Multiple Structural Change Tests." *The Econometrics Journal*, 6(1):72–78.

Bauer, M. 2015. "Inflation Expectations and the News." *International Journal of Central Banking*, 11(2):1–40.

Bauer, M. D. and McCarthy, E. 2015. "Can we Rely on Market-Based Inflation Forecasts?" *FRBSF Economic Letter*, 30.

Beechey, M. J., Johannsen, B. K., and Levin, A. T. 2011. "Are Long-Run Inflation Expectations Anchored More Firmly in the Euro Area than in the United States?" *American Economic Journal: Macroeconomics*, 3(2):104–29.

Carroll, C. D. 2003. "Macroeconomic Expectations of Households and Professional Forecasters." *The Quarterly Journal of Economics*, 118(1):269–298.

Chan, J. C., Clark, T. E., and Koop, G. 2018. "A New Model of Inflation, Trend Inflation, and Long-Run Inflation Expectations." *Journal of Money, Credit and Banking*, 50(1):5–53.

Ciccarelli, M., Garcia, J. A., and Montes-Galdón, C. 2017. "Unconventional Monetary Policy and the Anchoring of Inflation Expectations." *ECB Working Paper*, No 1995.

Clements, M. P. and Galvão, A. B. 2009. "Forecasting US Output Growth Using Leading Indicators: An Appraisal Using MIDAS Models." *Journal of Applied Econometrics*, 24(7):1187–1206.

De Pooter, M., Robitaille, P., Walker, I., and Zdinak, M. 2014. "Are Long-Term Ination Expectations Well Anchored in Brazil, Chile, and Mexico?" *International Journal of Central Banking*, 10(2):337–400.

Doh, T. and Oksol, A. 2018. "Has the Anchoring of Inflation Expectations Changed in the United States during the Past Decade?" *Economic Review of Federal Reserve Bank of Kansas City*, (Q 1):5–32.

Faust, J. and Wright, J. H. 2013. "Forecasting Inflation." In *Handbook of Economic Forecasting*, volume 2, pages 2–56. Elsevier.

Fleming, M. J. and Sporn, J. 2013. "Trading Activity and Price Transparency in the Inflation Swap Market." *Economic Policy Review*, 19(1):1–20.

Galati, G., Poelhekke, S., and Zhou, C. 2011. "Did the Crisis Affect Inflation Expectations." *International Journal of Central Banking*, 7(1):167–207.

Ghysels, E. and Ozkan, N. 2015. "Real-Time Forecasting of the US Federal Government Budget: A Simple Mixed Frequency Data Regression Approach." *International Journal of Forecasting*, 31(4):1009–1020.

Ghysels, E., Sinko, A., and Valkanov, R. 2007. "MIDAS Regressions: Further Results and New Directions." *Econometric Reviews*, 26(1):53–90.

Ghysels, E. and Wright, J. H. 2009. "Forecasting Professional Forecasters." *Journal of Business & Economic Statistics*, 27(4):504–516.

Gil-Alana, L., Moreno, A., and Pérez de Gracia, F. 2012. "Exploring Survey-Based Inflation Forecasts." *Journal of Forecasting*, 31(6):524–539.

Grothe, M. and Meyler, A. 2015. "Inflation Forecasts: Are Market-Based and Survey-Based Measures Informative?" *ECB Working Paper*, No 1865.

Gürkaynak, R. S., Levin, A., and Swanson, E. 2010. "Does Inflation Targeting Anchor Long-Run Inflation Expectations? Evidence from the US, UK, and Sweden." *Journal of the European Economic Association*, 8(6):1208–1242.

Kozicki, S. and Tinsley, P. A. 2012. "Effective Use of Survey Information in Estimating the Evolution of Expected Inflation." *Journal of Money, Credit and Banking*, 44(1):145–169.

Łyziak, T. and Paloviita, M. 2017. "Anchoring of Inflation Expectations in the Euro Area: Recent Evidence Based on Survey Data." *European Journal of Political Economy*, 46:52–73.

Mehrotra, A. and Yetman, J. 2018a. "Are Inflation Targets Credible? A Novel Test." *Economics Letters*, 167:67–70.

Mehrotra, A. and Yetman, J. 2018b. "Decaying Expectations: What Inflation Forecasts Tell us about the Anchoring of Inflation Expectations." *International Journal of Central Banking (forthcoming)*.

Monteforte, L. and Moretti, G. 2013. "Real-Time Forecasts of Inflation: The Role of Financial Variables." *Journal of Forecasting*, 32(1):51–61.

Natoli, F. and Sigalotti, L. 2018. "Tail Co-Movement in Ination Expectations as an Indicator of Anchoring." *International Journal of Central Banking*, 14(1):35–71.

Nautz, D., Pagenhardt, L., and Strohsal, T. 2017. "The (De-) Anchoring of Inflation Expectations: New Evidence from the Euro Area." *The North American Journal of Economics and Finance*, 40:103–115.

Nautz, D. and Strohsal, T. 2015. "Are US Inflation Expectations Re-anchored?" *Economics Letters*, 127:6–9.

Nautz, D., Strohsal, T., and Netšunajev, A. 2018. "The Anchoring of Inflation Expectations in the Short and in the Long Run." *Macroeconomic Dynamics (forthcoming)*.

Speck, C. 2017. "Inflation Anchoring in the Euro Area." *ECB Working Paper*, No 1998.

Stark, T. 2013. "SPF Panelists Forecasting Methods: A Note on the Aggregate Results of A November 2009 Special Survey." Technical report. `http://www.phil.frb.org/research-and-Data/real-time-center/survey-of-professional-forecasters/spf-special-survey-on-forecast-methods.pdf`.

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